

Australian goblin spiders of the genus *Opopaea* Simon, part 1. The species of the IBISCA-Queensland Project at Lamington National Park (Araneae: Oonopidae)

Barbara C. BAEHR

Queensland Museum, PO Box 3300, South Brisbane Qld 4101, Australia. Email: barbara.baehr@qm.qld.gov.au

CSER, School of Environmental and Life Sciences, University of Newcastle, Callaghan, NSW 2308, Australia.

Citation: Baehr, B.C. 2011 12 20. Australian Goblin Spiders of the genus *Opopaea* Simon, part 1. The species of the IBISCA-Queensland Project at Lamington National Park (Araneae: Oonopidae). *Memoirs of the Queensland Museum – Nature* 55(2): 413-437. Brisbane. ISSN 0079-8835.

ABSTRACT

The IBISCA-Queensland Project, an intensive survey of invertebrates along an altitudinal gradient within subtropical rainforest at Lamington NP in Queensland, Australia, revealed eight new species of the goblin spider genus *Opopaea* Simon, 1891 including: *O. antoniae* sp. nov., *O. jonesae* sp. nov., *O. leica* sp. nov., *O. olivernashi* sp. nov., *O. rogerkitchingi* sp. nov., *O. sown* sp. nov., *O. speighti* sp. nov. and *O. yukii* sp. nov., each described from both sexes. A key is provided for these Australian *Opopaea* species and their altitudinal distributions are discussed. □ *Opopaea*, Lamington National Park, Goblin Spiders, IBISCA

The IBISCA-Queensland Project, led by Prof. Roger Kitching, was an international collaborative project that aimed to determine groups of organisms that can serve as indicators of climate change at different altitudinal zones in the rainforest of Lamington National Park. During the fieldwork of the IBISCA-Queensland Project, conducted between 2006 and 2008, eight new species of goblin spiders of the genus *Opopaea* Simon were found. *Opopaea* belongs to the *Oonopidae*, a megadiverse spider family currently with 755 described species in 83 genera and approximately 2500 expected species worldwide (Platnick 2009). These small goblin spiders (0.5–4.0 mm in body length) are regularly found in most terrestrial habitats, particularly in litter, under bark and even in the forest canopy. Goblin spiders occur throughout mainland Australia as well as Tasmania.

Until relatively recently only 13 indigenous Australian species have been described in

the genera *Camptoscapliella* Caporiacco, *Gamasomorpha* Karsch, *Grymens* Harvey, *Oonops* Templeton, *Opopaea* and *Orchestina* Simon (Harvey 1987; Harvey & Edward 2007; Hickman 1932, 1950; Koch 1873; Rainbow 1920; Simon 1908). In addition, the introduced species *Oonops pulcher* Templeton, 1835 has been recorded from Tasmania (Hickman 1979). Recent publications have revealed another 21 Australian goblin spiders species of the genera *Cavisternum* Baehr, Harvey & Smith, *Pelcinus* Simon and *Xestaspis* Simon (Baehr, Harvey & Smith 2010; Ott & Harvey 2008a, b) as part of a world-wide revision of the family Oonopidae conducted by the “Goblin Spider PBI” project (see <http://research.amnh.org/oonopidae/>). Australian museum collections contain at least another 500 new goblin spider species. However, the discovery of numerous new spider taxa from Australia is not astonishing, as revisions of ground-dwelling spiders over

recent years have discovered a huge number of new taxa across a wide variety of spider families (e.g. Zodariidae: Baehr 2008; Prodidomidae: Platnick & Baehr 2006; Zoropsidae: Raven & Stumkat 2005; Pararchaeidae: Rix 2006).

Species of *Opopaea* are united by their orange-brown colouration, lentil-like abdominal scutae and huge, club-shaped palpal patellae. *Opopaea* is one of the most diverse Australian goblin spider genera but only three species have been described to date; one species from South Australia (Hickman 1950) and two blind, troglobitic species from Western Australia (Harvey & Edward 2007). The description of eight new *Opopaea* species collected during the IBISCA project is the first revisionary paper on the Australian goblin spiders of the genus *Opopaea* as part of the 'Goblin Spider PBI' project. It is likely that the rainforest *Opopaea* species described here are short-range endemics with very small distributions (Harvey 2002) and may prove to be important taxa for monitoring the effects of climate change.

MATERIAL AND METHODS

Large areas of Lamington National Park, situated in south-eastern Queensland (Fig. 63), are covered with subtropical rainforest, ranging from lowland rainforest at around 300 metres above sea level (m a.s.l.) to cool, misty, *Nothofagus* dominated rainforest at 1100 m a.s.l. During the IBISCA-Queensland Project (Kitching *et al.* 2011), intensive surveys were undertaken at four plots (A, B, C and D) within each of five altitudinal zones at approximately 300, 500, 700, 900 and 1100 m a.s.l. from 2006 to 2008. Precise location details and elevations of the main IBISCA plots, as well as those of a number of supplementary plots where additional collections of *Opopaea* specimens are presented in Table 1 (see also Kitching *et al.* 2011).

Specimens of *Opopaea* were collected using a range of methods including pitfall traps, litter extractions and bark spraying. The latter technique involved thoroughly spraying the trunks of large trees using hand-held cans of Mortein Fast Knockdown[®] insecticide, directing the jet of spray from the base to as far as possible up the trunk. Falling insects were collected on a rectangular sheet of rip-stop nylon (160 x 105 cm) placed at the base of each tree (see Burwell & Nakamura 2011 for more details).

Specimens were examined using a LEICA MZ16A microscope. Photomicrographic images were produced using a Leica DFC 500 and the software program AutoMontage Pro Version 5.02 (p). SEM's were taken with a Hitachi S530. Descriptions were generated with the aid of the PBI descriptive goblin spider database and shortened where possible. The map was created with the simpler mapper of the PBI Goblin Spider Project; <http://research.amnh.org/pbi/maps/>. All measurements are in millimetres. All specimens are deposited in the Queensland Museum. Morphological terminology for the female genitalia follows Burger (2010). Abbreviations used in the text and figures are: ALE, anterior lateral eye(s); C/L, connection of femur/patella; Ch, broad triangular chitinised area of female genitalia; GAP, globular appendix of female genitalia; L, length of male patella; Na, nail-like process of female genitalia; PLE, posterior lateral eye(s); PME, posterior median eye(s); PSc, paddle-like sclerite of female genitalia; W, width of male patella; W/L, male patella width/length. Abbreviations for collectors used in the material examined are: AM, A. Marcora; AN, A. Nakamura; CB, C. Burwell; DP, D. Putland; FT, F. Turco; GM, G. Monteith; GT, G. Thompson; KS, K. Staunton; SW, S. Wright. Specimens in the material examined section are grouped according to the IBISCA-Queensland study plots, with increasing altitude and plot number, followed by additional material collected from outside

New *Opopaea* species from Lamington NP

TABLE 1. Latitude and longitude (in decimal degrees), and precise elevation (metres above sea level) of the main IBISCA-Queensland survey plots and supplementary IBISCA-Queensland plots from which *Opopaea* specimens examined in this study were collected.

IBISCA-Qld plot name	Latitude (°S)	Longitude (°E)	Elevation (m a.s.l.)
Main plots			
300A	28.148	153.137	267
300B	28.155	153.139	282
300C	28.151	153.138	260
300D	28.142	153.133	248
500A	28.216	153.142	560
500B	28.212	153.141	514
500C	28.210	153.139	474
500D	28.207	153.137	471
700A	28.188	153.121	746
700B	28.192	153.124	775
700C	28.193	153.128	748
700D	28.204	153.129	748
900A	28.234	153.141	904
900B	28.238	153.145	950
900C	28.240	153.149	944
900D	28.227	153.131	920
1100A	28.258	153.159	1141
1100B	28.259	153.162	1142
1100C	28.260	153.167	1106
1100D	28.262	153.170	1140
Supplementary			
700CKA	28.237	153.152	720
850	28.215	153.126	841
1000	28.247	153.149	995

the IBISCA transect (for precise locality and altitude information for the IBISCA plots refer to Table 1).

OPOPAEA SPECIES OF LAMINGTON NATIONAL PARK AND THEIR ALTITUDINAL PREFERENCES

In total 255 specimens of *Opopaea* were collected during the IBISCA-Queensland project.

Specimens of *Opopaea* were collected from all five altitudinal zones (300 m a.s.l.: 83 specimens, 500 m: 59, 700 m: 71, 900 m: 21, 1100 m: 21). The *Opopaea* species from the rainforest of Lamington NP are all extremely similar in their body shape (Figs 1–10). They differ only in their eye size, the arrangement of sternal setae between coxa IV (Fig. 60 arrow) and their genitalia. Although the genus *Opopaea* is found throughout the range of altitudes surveyed during the IBISCA-Queensland project, individual *Opopaea* species appear to have restricted altitudinal distributions (Fig. 64, Table 2), although there is insufficient data to enable statistical analysis of the species' altitudinal preferences.

The *Opopaea* species treated here can be divided in 2 groups according to their eye size (Table 2):

Species with small (diameter of ALE less than 0.045 mm), subequal eyes (*O. sown* sp. nov., *O. jonesae* sp. nov., *O. rogerkitchingi* sp. nov.). These are evidently litter-inhabiting species that were collected only by pitfall traps or litter extraction. This group of species showed distinct altitudinal zonation with *O. sown* collected only from the lowest elevations (300 m a.s.l.), *O. jonesae* found at mid-elevations (500–900 m a.s.l.), most commonly between 500 and 700 m a.s.l, and *O. rogerkitchingi* found at mid to high elevations (700–1100 m a.s.l.), most commonly at the highest elevation of 1100 m a.s.l. (Fig. 64, oval circles).

Species with large eyes, nearly twice as large as those of the former group (*O. antoniae* sp. nov., *O. leica* sp. nov., *O. oliveruashii* sp. nov., *O. speighti* sp. nov., *O. yukii* sp. nov.). Whereas *O. yukii* and *O. antoniae* were collected only on tree trunks by bark spraying, *O. oliveruashii*, *O. leica* and *O. speighti* are apparently litter-inhabiting species (collected by pitfall traps or litter extraction). *Opopaea yukii*, the only dorso-ventrally flattened, large-eyed species, appeared in high numbers at all altitudes, except at 1100 m where it was replaced by *O. antoniae* (which occurs from 700–1100 m

TABLE. 2 *Opopaea* species from Lamington National Park characterised by: lateral habitus, eye size, including the diameter of the anterior lateral eyes (ALE), microhabitat, IBISCA-Queensland elevational zones from which they were collected and the total number of specimens examined.

Species	Lateral habitus	Eye size	ALE diameter (mm)	Main habitat	Elevational range (m a.s.l.)	Number of specimens
<i>O. rogerkitchingi</i>	flattened	small	0.034	litter	700-1100	22
<i>O. jonesae</i>	normal	small	0.040	litter	500-900	46
<i>O. sown</i>	flattened	small	0.041	litter	300	9
<i>O. speighti</i>	normal	large	0.048	litter	900-1000	5
<i>O. olivernashi</i>	normal	large	0.077	litter	500-700	15
<i>O. leica</i>	normal	large	0.069	litter	300-700	11
<i>O. antoniae</i>	normal	large	0.077	bark	700-1100	11
<i>O. yukii</i>	flattened	large	0.076	bark	300-900	136

a.s.l.) presumably because of the very mossy bark of trees at 1100 m. The large-eyed litter species *O. olivernashi* (500–700 m a.s.l.), *O. leica* (300–700 m a.s.l.) and *O. speighti* (900–1000 m a.s.l.) appeared to show distinct altitudinal preferences though only relatively few specimens of each species were collected.

This study demonstrates that particular *Opopaea* species have specific habitat preferences along the IBISCA altitudinal gradient, especially *O. antoniae*, *O. rogerkitchingi* and *O. speighti* which are largely restricted to high elevations like a number of orsolobid spider species (Baehr *et al.* 2011) and hence are a good potential target group for monitoring the effects of future climate change.

SYSTEMATICS

Family Oonopidae Simon, 1890

Opopaea, Simon 1891

Opopaea Simon, 1891:560 (type species by monotypy *Opopaea deserticola* Simon)

Diagnosis and description see Platnick & Dupérré (2009).

Diagnosis. Males of *Opopaea* can be easily recognised by their big, club-shaped palpal patella which originates sub-basally or medially from the palpal femur (Figs 20–43) and the strong, tooth-like projection at the anteromedian tip of the endites (Fig. 60 white arrow). Females are more difficult to characterise but can be distinguished by the wide triangular chitinised area near the genital opening (Fig. 44) and the internal t-shaped or paddle-like sclerite situated near the genital opening (Fig. 51). All *Opopaea* species from Lamington NP differ from *Opopaea deserticola* Simon in having a high rebordered clypeus and the ALE separated from the edge of the carapace by their radius or more.

Description. *Opopaea* species collected from Lamington National Park including *O. antoniae* sp. nov., *O. jonesae* sp. nov., *O. leica* sp. nov., *O. olivernashi* sp. nov., *O. rogerkitchingi* sp. nov., *O. sown* sp. nov., *O. speighti* sp. nov., *O. yukii* sp. nov. share the following characters: **Male:** Carapace ovoid in dorsal view without any pattern (Figs 1–8), anteriorly narrowed to 0.49 times its maximum width or less, surface of elevated portion of pars cephalica smooth, sides striated, thorax without depressions, fovea absent, without radiating rows of pits; lateral

margin straight, rebordered, without denticles; non-marginal pars cephalica setae needle-like, present in u-shaped row; non-marginal pars thoracica setae absent; marginal setae absent. *Clypeus* rebordered, curved downwards in front view, vertical in lateral view, high, ALE separated from edge of carapace by their radius or more. *Chilum* absent. *Eyes* six, well-developed, posterior eye row straight from above, procurved from front. *Sternum* longer than wide, uniform, fused to carapace, with radial furrows between coxae I-II, II-III, III-IV, furrow with rows of small pits, microsculpture only in furrows, rest of surface smooth, anterior margin unmodified, posterior margin not extending posteriad of coxae IV, distance between coxae approximately equal, lateral margin with infra-coxal grooves and anterior and posterior openings; setae needle-like, originating from small pits. *Mouthparts* Chelicerae straight, directed medially, anterior face unmodified; without teeth on both promargin and retromargin; without tooth-like projections; paturon inner margin with pairs of enlarged setae, distal region unmodified. Labium triangular, fused to sternum, anterior margin indented at middle. Endites, serrula in single row, anteromedian tip with one strong, tooth-like projection. *Abdomen* ovoid, rounded posteriorly, soft portions white; book lung covers without setae, anterolateral edge unmodified. Posterior spiracles connected by groove. Pedicel tube short, ribbed, with small, dorsolateral, triangular extensions; scuto-pedicel region with paired curved scutal ridges, scutum not extending far dorsad of pedicel. Dorsal scutum strongly sclerotised, without colour pattern, covering full length of abdomen, no soft tissue visible from above, not fused to epigastric scutum, surface punctate, anterior half without projecting denticles. Epigastric scutum strongly sclerotised, surrounding pedicel, not protruding, small lateral sclerites absent. Postepigastric scutum strongly sclerotised, long, semicircular, covering nearly full length of

abdomen, fused to epigastric scutum, anterior margin unmodified, with long posteriorly directed lateral apodemes. Spinneret scutum present as incomplete ring with fringe of short setae. Supra-anal scutum absent. Dorsum of epigastric and postepigastric areas with uniform setae. Interscutal membrane with setae. Colulus represented only by 2 setae. *Legs* without colour pattern; patella plus tibia I shorter than carapace, no scopula. Leg spines absent. Tarsi I to IV without inferior claw. *Genitalia* Epigastric region with sperm pore small, oval, situated at level of anterior spiracles. *Palp* trochanter minute, with ventral projection; femur triangular with wide basis, attaching to patella sub-basally to medially; patella much larger than femur, club-shaped; tibia small; cymbium and bulb at least partly fused, bulb 1 to 1.5 times as long as cymbium, slender, distal part with dorsal fenestra.

Female: As in male except as noted. Endites without anteromedian tooth-like projection. Epigastric and postepigastric scutum not fused. *Genitalia* in ventral view: Between genital opening and grove, connecting posterior spiracles, is a wide triangular chitinised area, situated close to genital opening (Figs 44, 46, 48, 50, 52, 54, 56, 58). *Genitalia* in dorsal view: t-shaped or paddle like sclerite situated near genital opening (Figs 45, 47, 49, 51, 53, 55, 57, 59) with nail-like process (Na) fitting into posterior situated globular appendix (GAP).

KEY TO SPECIES OF *OPOPAEA*
OF LAMINGTON NP

1. Males 2
– Females 9
2. Eyes small, subequal, PME diameter less than 0.04 mm (Figs 2, 5, 6) 3
– Eyes large, ALE or PME largest, PME at least 0.05 mm (Figs 1, 3, 4, 7, 8) 5
3. Sternum swollen between coxae IV 4
– Sternum not swollen between coxae IV *O. sown* sp. nov.

4. Setae between coxae IV arranged in a circle and directed centrally *O. rogerkitchingi* sp. nov.
 – Setae between coxae IV arranged in a longitudinal band *O. joesae* sp. nov.
5. Carapace and abdomen flat in lateral view (Fig. 9) *O. yukii* sp. nov.
 – Carapace and abdomen slightly elevated in lateral view (Fig. 10) 6
6. Sternum between coxae IV with posterior swelling and hair tuft (Fig. 60) *O. leica* sp. nov.
 – Sternum between coxae IV without posterior swelling and hair tuft (Fig. 11) 7
7. Palpal bulb and cymbium without retrolateral seam (Figs 43) *O. speighti* sp. nov.
 – Palpal bulb and cymbium with retrolateral seam (Figs 22, 25) 8
8. Palpal femur connected to patella sub-basally, C/L 0.37 (Figs 20–22) .. *O. olivernashi* sp. nov.
 – Palpal femur connected to patella medially, C/L 0.48 (Figs 23–25) ... *O. antoniae* sp. nov.
9. Eyes small, subequal, PME diameter less than 0.04 mm (Figs 2, 5, 6) 10
 – Eyes large, ALE or PME largest, PME at least 0.05 mm (Figs 1, 3, 4, 7, 8) 12
10. Chitinised area of female genitalia in ventral view a broad band, posterior knob-like extension square (Fig. 54). *O. rogerkitchingi* sp. nov.
 – Chitinised area of female genitalia in ventral view a narrow band, posterior knob-like extension triangular (Figs 50, 52) 11
11. Globular appendix (see Fig. 47, GAP) without hood but with keel-like extension (Fig. 51) *O. sownu* sp. nov.
 – Globular appendix with hood and triangular posterior extension (Fig. 53) *O. joesae* sp. nov.
12. Carapace and abdomen flat in lateral view (Fig. 9); chitinised area of female genitalia a narrow band with small sinuous posterior extension (Fig. 56) *O. yukii* sp. nov.
 – Carapace and abdomen slightly elevated in lateral view (Fig. 10); chitinised area of female genitalia broadly triangular (Figs 44, 46, 48, 58) 13
13. Globular appendix embedded in chitinised area which has a small dorsally bent median tip (Fig. 47) *O. antoniae* sp. nov.
 – Globular appendix not embedded in chitinised area (Figs. 45, 49, 59) 14
14. Globular appendix divided into hood and v-shaped extension (Fig. 45) *O. olivernashi* sp. nov.
 – Globular appendix divided into hood and small globular extension (Figs 49, 59) .. 15
15. Chitinised area of female genitalia with narrow triangular posteriorly directed extension (Fig. 58) *O. speighti* sp. nov.
 – Chitinised area of female genitalia with broad triangular posteriorly directed extension (Fig. 48) *O. leica* sp. nov.

Opopaea antoniae sp. nov.

(Figs 1, 11–14, 16–19, 23–25, 46, 47, 63)

Etymology. Named for Antonia Burwell-Rodriguez, daughter of Chris Burwell, Senior Curator of Entomology at the Queensland Museum, in recognition of his contributions to ecology and taxonomy and to his daughter's love for little creatures.

Material. Holotype ♂, Queensland, Lamington NP, IBISCA 1100C, 28.206°S 153.167°E, 1106 m, 26 Oct 2006, CB, bark spray (PBL_OON 23239, QM S86315).

Other Material. QUEENSLAND, IBISCA 700A: 1♀, 18 Jan 2008, AN, bark spray (PBL_OON 23353, QM S84085); 1♂, 1♀, 26 Sep 2008, GM, FT, bark spray (PBL_OON 23361, QM S86426). IBISCA 700C: 2♂, 2♀, 26 Sep 2008, GM, FT, bark spray (PBL_OON 23360, QM S86423). NEW SOUTH WALES, 1♀, 1♂, Wiangaree, Beach Picnic Area, 28.36666°S 153.1°E, 1050 m, 15 Dec 2008, GM, pyrethrum *Nothofagus* (PBL_OON 23341, QM S84083).

Diagnosis. *Opopaea antoniae* resembles *O. olivernashi* in colour and eye size. Females and males of *O. antoniae* can be separated from all other species of *Opopaea* known from Lamington NP by their small, round and darker brown book lung covers. Males of *O. antoniae* and *O. olivernashi* are the only Lamington species with a retrolateral seam between

the bulb and cymbium. Males of *O. antoniae* can be easily separated from *O. olivernashi* by their slimmer patella, the median connection to the femur ($C/L=0.48$) and the slim bulb. Females of *O. antoniae* can be distinguished from all other *Opopaea* species by the broad triangular chitinised area (Ch) near the genital opening.

Description. *Male* (holotype, PBI_OON 23239). Total length 1.70. *Colour in alcohol.* Body yellow-brown, legs and palp pale orange, only patella reddish brown. *Carapace* pars cephalica slightly elevated in lateral view, with rounded posterolateral corners. *Chypeus* high, rebordered (Fig. 12) with four long setae in inverted v-shaped position. *Eyes* very large, ALE largest. ALE: 0.077; PME: 0.064; PLE: 0.055; Eye-group width: 0.226; PME oval, PLE circular; ALE separated by less than their radius, ALE-PLE separated by less than ALE radius, PME touching throughout most of their length, PLE-PME touching. *Abdomen* book lung covers small, round, darker brown than surrounding abdomen. *Legs* (trichobothria examined with SEM) tibiae I-IV with 3 dorsal trichobothria (Fig. 17), metatarsi I-IV with 1 dorso-distal trichobothrium (Fig. 16), base rounded, hood smooth. Tarsal claws I-IV striated with 5 strong ventral teeth (Figs 13-14). *Genitalia* (Figs 23-25): femur medially attached to patella ($C/L=0.48$, Fig. 25); patella: $W/L=0.58$; $L=0.280$; $W=0.162$; $C=0.134$ (mm); cymbium ovoid in dorsal view, fused with bulb, but seam visible on retrolateral side, with distal patch of setae.

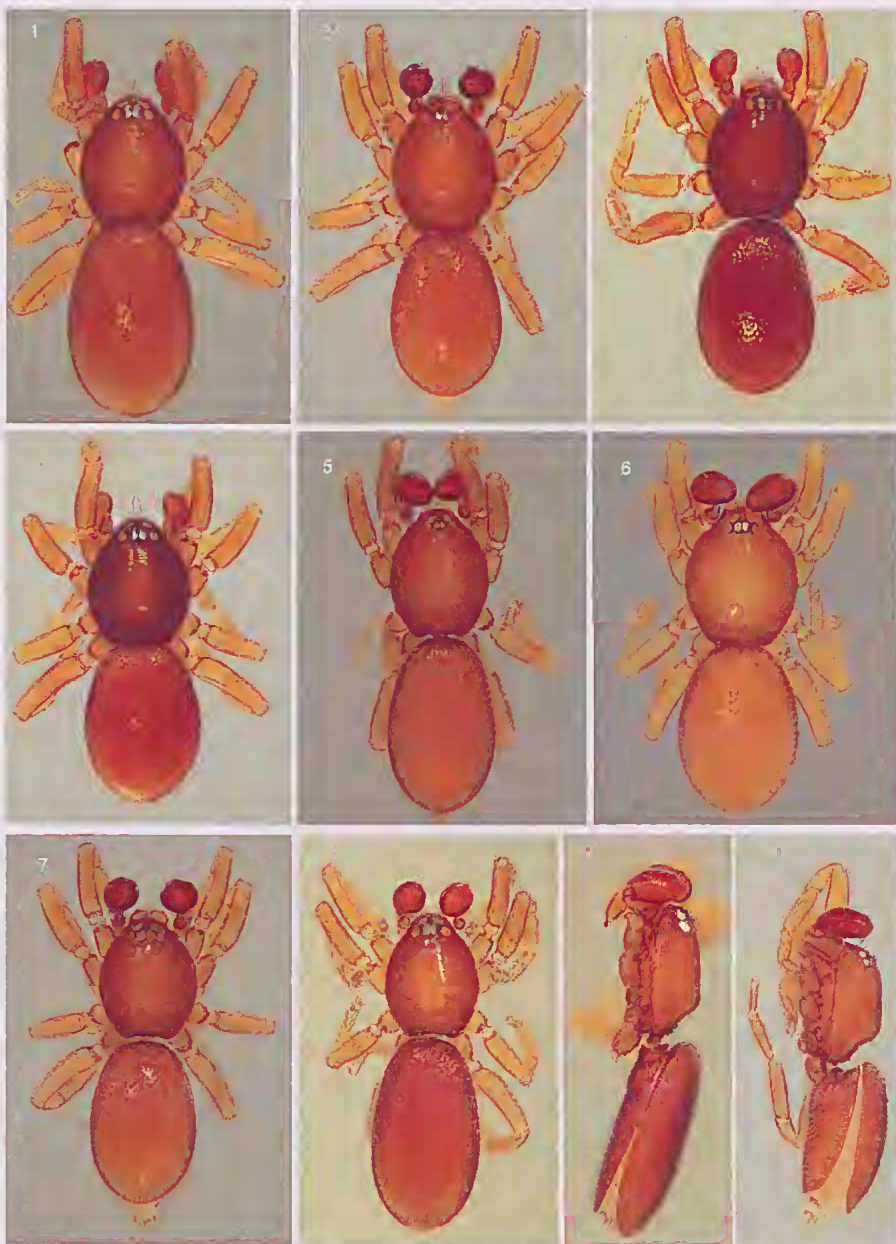
Female. (PBI_OON 23341) Total length 1.88. As in male except as noted. *Eyes* very large; ALE: 0.070; PME: 0.052; PLE: 0.045; Eye-group width: 0.207. *Genitalia* (Figs 46-47): Broad triangular chitinised area (Ch) in ventral view, with small dorsally bent median tip (arrow) in dorsal view; paddle-like sclerite (PSc) with thin straight arms bent at end; nail-like process (Na) large, well separated; globular appendix (GAp) globular embedded in chitinised area.

Distribution. This species is only known from the southeast corner of Queensland and north-eastern New South Wales (Fig. 63).

Opopaea jonesae sp. nov.
(Figs 2, 10, 29-31, 52, 53, 62, 63)

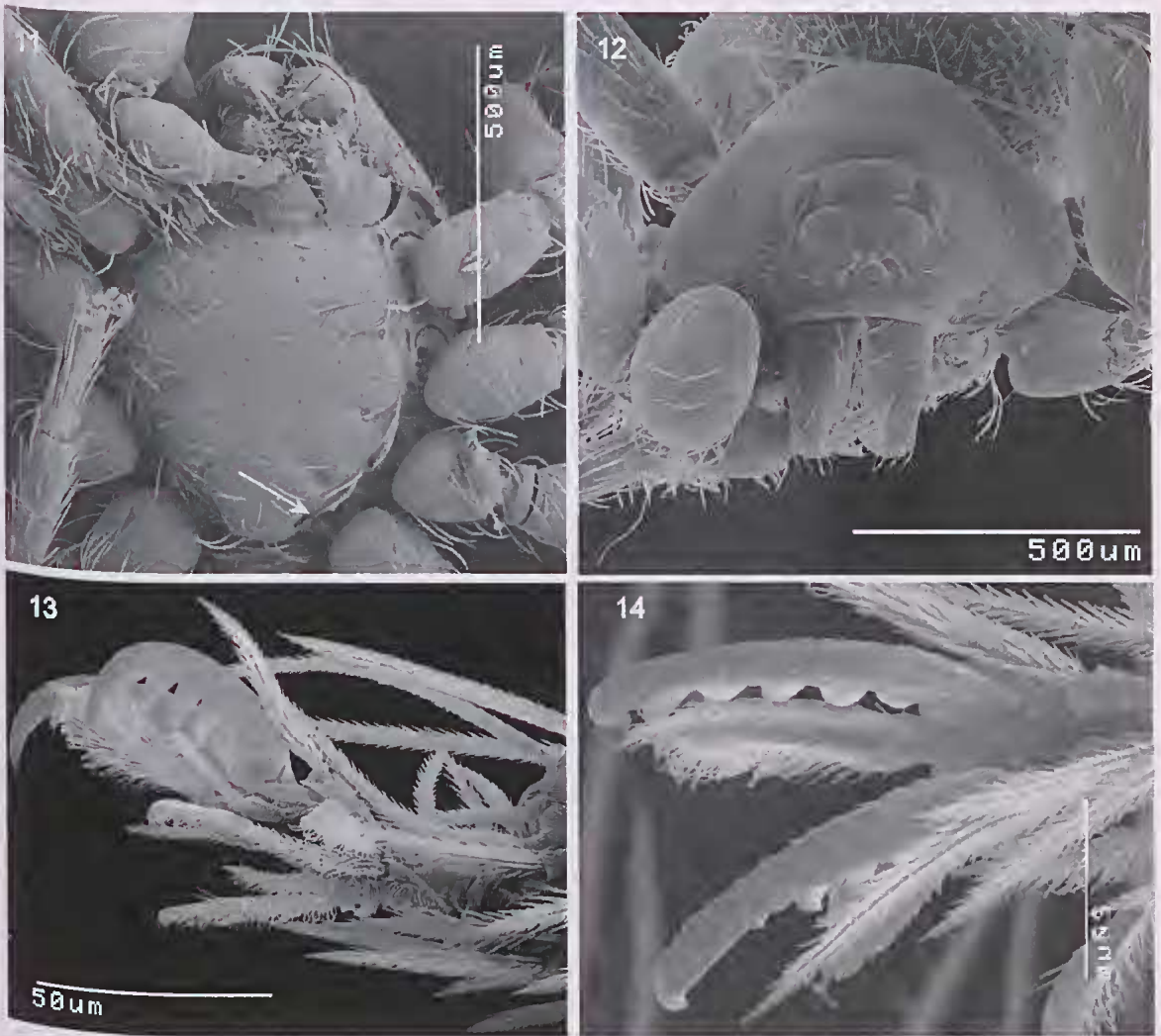
Etymology. A patronym in honour of Anne Jones, former Chair of the Queensland Museum Board, for her love of nature and her outstanding service and support of the Queensland Museum over many years.

Material. Holotype ♂, Queensland, Lamington NP, IBISCA, 700C, 28.193°S, 153.128°E, 748 m, 12-21 Feb 2007, KS, pitfall (PBI_OON 22751, QM S76160). PARATYPE, QUEENSLAND, 1♀, same data as holotype but (PBI_OON 23355, QM S87075). OTHER MATERIAL, QUEENSLAND, 1♂, Lamington NP, 0.6 km N of Ballanjui Falls, 28.207°S, 153.203°E, 460 m, 19 Mar 2008, SW, AN, berlesate sifted litter (PBI_OON 23245, QM S86327). IBISCA 500A: 3♂, 12-21 Feb 2007, KS, pitfall (PBI_OON 22709, QM S76055); 1♂, 12-21 Mar 2007, DP, KS, pitfall (PBI_OON 23322, QM S86401); 2♂, 28 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23268, QM S86387), 1♂, same data (PBI_OON 23274, QM S86390). IBISCA 500B: 1♀, 28 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23273, QM S86385). IBISCA 500C: 1♂, KS, pitfall (PBI_OON 22749, QM S76054); 1♂, 8 Oct 2006, BB (PBI_OON 22736, QM S75880); 1♂, 12-21 Mar 2008, DP, KS, pitfall (PBI_OON 23330, QM S866400); 2♂, 28 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23265, QM S86381, PBI_OON 23276, QM S86386), 1♀, (PBI_OON 23265, QM S86381). IBISCA 500D: 1♂, 28 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23264, QM S86382); 1♀, 1♂ same data (PBI_OON 23272, QM S86393). IBISCA 700B: 1♀, AN, leaf litter extract (PBI_OON 23263, QM S86339); 1♀, 1♂, 14-23 Jan 2007, KS, pitfall (PBI_OON 23240, QM S86311); 1♂, 12-21 Feb 2007, KS, pitfall (PBI_OON 22742, QM S76085); 1♀, 13-22 Mar 2007, DP, KS, pitfall (PBI_OON 23246, QM S86320); 1♀, 18 Jan 2008, SW, leaf litter extract (PBI_OON 23266, QM S86352); 2♀, 1♂, 26 Sep 2008, GM, FT, litter berlesate (PBI_OON 23358, QM S86429). IBISCA 700C: 1♀, 14-23 Jan 2007, KS, pitfall (PBI_OON 23241, QM S86309); 1♂, 12-21 Feb 2007, KS, pitfall (PBI_OON 23354, QM S87074); 2♀, 20 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23267, QM S86346, PBI_OON 23270, QM S86343). IBISCA 700CKD: 2♀, 22 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23253, QM S86318). IBISCA 700D: 1♂, 11-20 Oct 2006, KS, pitfall (PBI_OON 22715, QM S81116); 2♂, 13-22 Mar 2007, DP,



FIGS 1-10. *Opopaea* species of Lamington National Park. Male habitus, 1-8, dorsal; 9-10, lateral. 1, *O. antoniae* sp. nov. (PBI_23239); 2, *O. jonesae* sp. nov. (PBI_22751); 3, *O. leica* sp. nov. (PBI_23237); 4, *O. olivernashi* sp. nov. (PBI_23254); 5, *O. rogerkitchingi* sp. nov. (PBI_22772); 6, *O. sown* sp. nov. (PBI_22746); 7, *O. speighti* sp. nov. (PBI_23256); 8-9, *O. yukii* sp. nov. (PBI_06383); 10, *O. jonesae* sp. nov. (PBI_22751).

New *Opopaea* species from Lamington NP



FIGS 11–14. *Opopaea antoniae* sp. nov. (PBI_OON 23360). 11, sternum ventral (arrow points to lateral margin with infra-coxal grooves and anterior and posterior openings); 12, carapace frontal; 13–14, tarsus IV, retrolateral (13) and dorsal (14) views.

KS, pitfall (PBI_OON 23248, QM S86319; PBI_OON 23249, QM S86322); 1♀, 2♂, 20 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23262, QM S86335). IBISCA 900D: 1♂, 12–21 Feb 2007, KS, pitfall (PBI_OON 22737, QM S76184); 1♂, 11–20 Mar 2007, DP, KS, pitfall (PBI_OON 23275, QM S86366). 2♀, 1♂, 0.5 km SSE Binna Burra Lodge, 28.198°S 153.190°E,

770 m, 18 Mar 2008, SW, AN, berlesate sifted litter (PBI_OON 23247, QM S86325).

Diagnosis. *Opopaea jonesae* resembles *O. rogerkitchingi* in colour and in having small eyes which are equal in size. Males of *O. jonesae* and *O. rogerkitchingi* have a slim bulb and a palpal patella with a median connection to the femur ($C/L=0.51$). Males of *O.*

jonesae can be easily separated by a longitudinal band of setae at the swollen posterior part of the sternum between coxae IV (Fig. 62) and the medially bent flagellate distal tip of the bulb. Females can be distinguished from those of *O. rogerkitchingi* by the narrow, widely triangular chitinised area near the genital opening.

Description. *Male* (holotype, PBI_OON 22751). Total length 1.41. *Colour in alcohol.* Body pale orange-brown, palpal patella reddish brown. *Carapace* pars cephalica slightly elevated in lateral view. *Clypeus* with few long setae in v-shaped position. *Eyes* small, subequal in size. ALE: 0.040; PME: 0.037; PLE: 0.034; eye quadrangle: 0.161, PME oval, PLE circular; ALE separated by their radius to diameter, ALE-PLE separated by less than ALE radius, PME touching for less than half their length, PLE-PME separated by less than PME radius. *Sternum* (Fig. 62) posterior part between coxae IV swollen, with longitudinal band of setae; other setae evenly scattered. *Abdomen.* Book lung covers large, ovoid. *Genitalia* (Fig. 29-31): patella big, club-shaped, $W/L=0.54$; connection to femur $C/L=0.51$. $L=0.305$; $W=0.166$; $C=0.155$; cymbium completely fused with bulb, no seam visible, distal tip of bulb medially bent, flagellate.

Female. (paratype, PBI_OON 23355) Total length 1.60. As in male except as noted. *Eyes* ALE: 0.042; PME: 0.036; PLE: 0.033; eye quadrangle: 0.137. *Genitalia* (Figs 52, 53): Narrow chitinised area (Ch) with small posteriorly directed v-shaped extension in ventral view; dorsal view, paddle-like sclerite (PSc) with evenly bent arms; nail-like process (Na) not well separated; globular appendix (GAp) separated into two parts, anterior part small globular, posterior part with triangular tip, not embedded in chitinised area.

Distribution. Only known from the southeast corner of Queensland (Fig. 63).

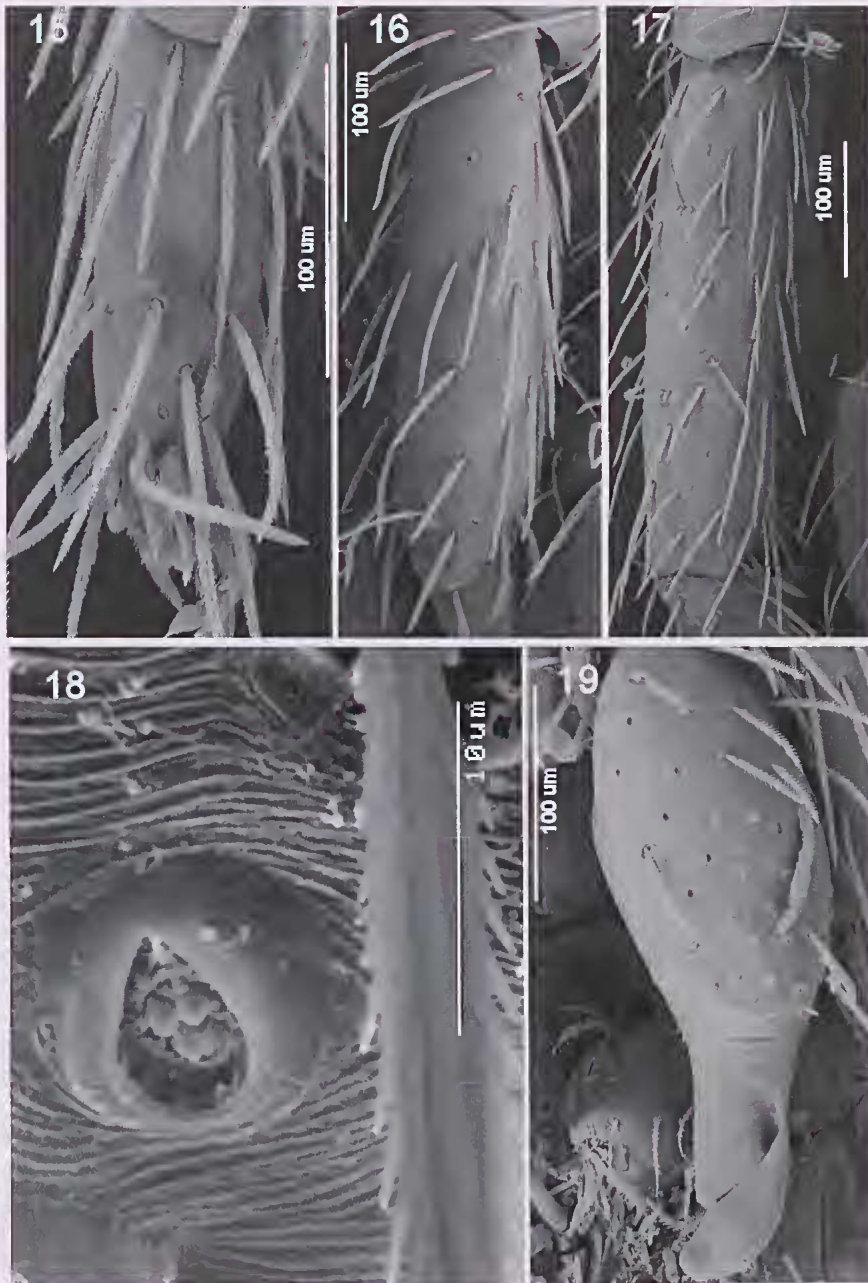
Opopaea leica sp. nov.
(Figs 3, 26-28, 48, 49, 60, 63)

Etymology. A patronym in honour of Leica Microsystems Pty Ltd, Australia and Dermot Allen the Product Manager-Division of Microscopy and Imaging, Sydney for their immense support in providing equipment for this taxonomic work.

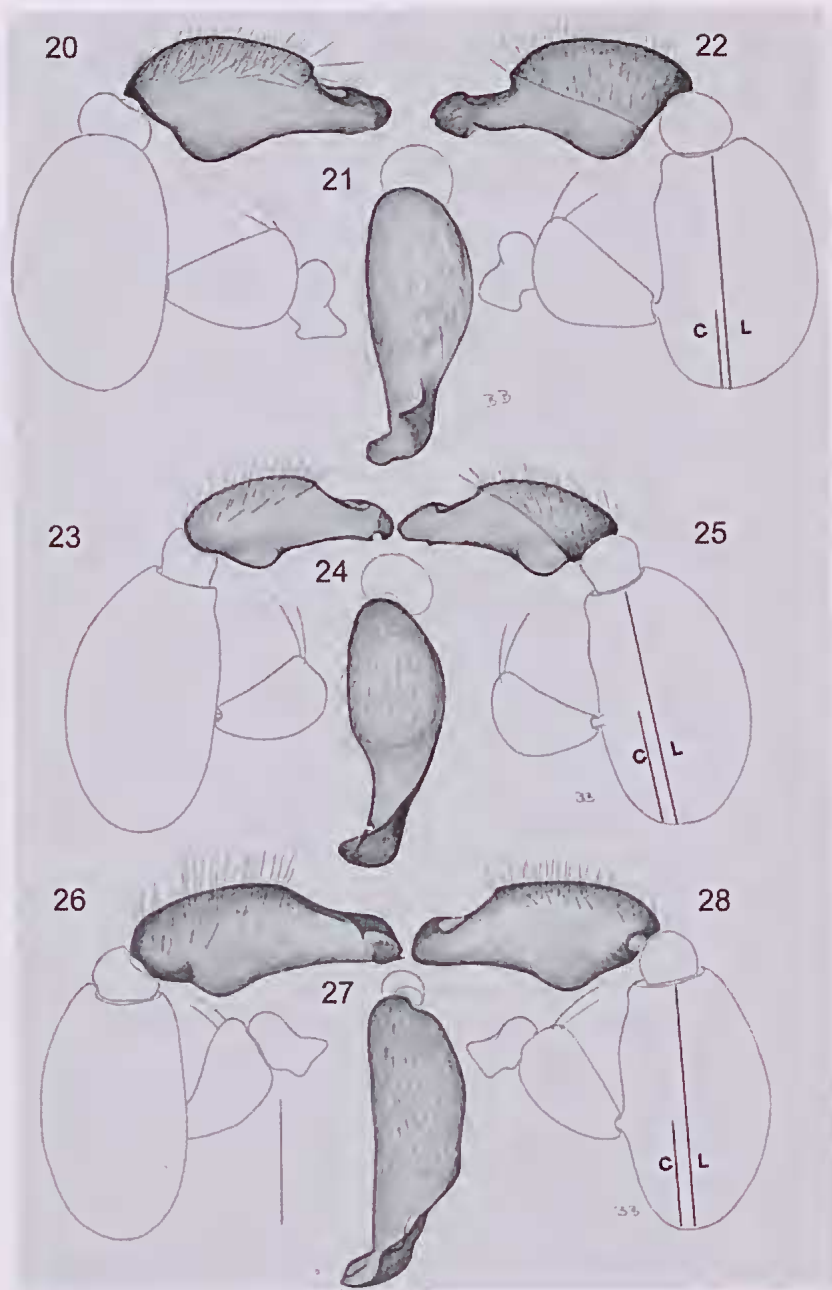
Material. Holotype ♂, Queensland, Lamington NP IBISCA, 700C, 28.193°S, 153.128°E, 748 m, 11-20 Oct 2006, KS, pitfall (PBI_OON 23237, QM S86307). PARATYPE, QUEENSLAND, 1♀, Lamington NP IBISCA, 700D, 28.204°S 153.129°E, 748 m, 20 Jan 2008, S. Wright, AN, leaf litter extract (PBI_OON 23282, QM S86336). OTHER MATERIAL, QUEENSLAND, IBISCA 300A: 2♂, 25 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23277, QM S86338). IBISCA 300C: 1♂, 18-23 Jan 2007, GM, fungus pitfall (PBI_OON 23243, QM S86310). IBISCA 700A: 1♀, 18 Jan 2008, AN, bark spray (PBI_OON 23293, QM S86391); 2♂, 13-22 Mar 2007, DP, KS, pitfall (PBI_OON 23251, QM S86317). IBISCA 700B: 1♂, 18 Jan 2008, AN, leaf litter extract (PBI_OON 23281, QM S86340); 1♂, (PBI_OON 23280, QM S86380). IBISCA 700D: 1♂, 20 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23356, QM S87073).

Diagnosis. *Opopaea leica* resembles *O. antoniae* and *O. olivernashi* in colour and the large size of the eye but males of *O. leica* can be easily separated by the sternal posterior hump and hair tuft between coxae IV (Fig. 60) and by the absence of a retrolateral seam separating the bulb from cymbium. Females resemble *O. olivernashi* but can be distinguished by having their globular appendix (GAp) separated into a small posterior globular and a hoodlike anterior part, with the GAp well separated from the chitinised plate (Ch).

Description. *Male* (holotype, PBI_OON 23237). Total length 1.67. *Colour in alcohol.* Body and palp dark red-brown, legs yellowish. *Carapace* pars cephalica slightly elevated in lateral view, with angular posterolateral corners. *Eyes* large, ALE largest. ALE: 0.069; PME: 0.057; PLE: 0.048; eye quadrangle: 0.201; PME oval, PLE circular; ALE separated by less than their radius; ALE-PLE separated by less than ALE radius; PME touching throughout most of their length; PLE-PME separated by less than PME radius. *Sternum* furrows smooth, microsculpture absent, with posterior swelling between coxae

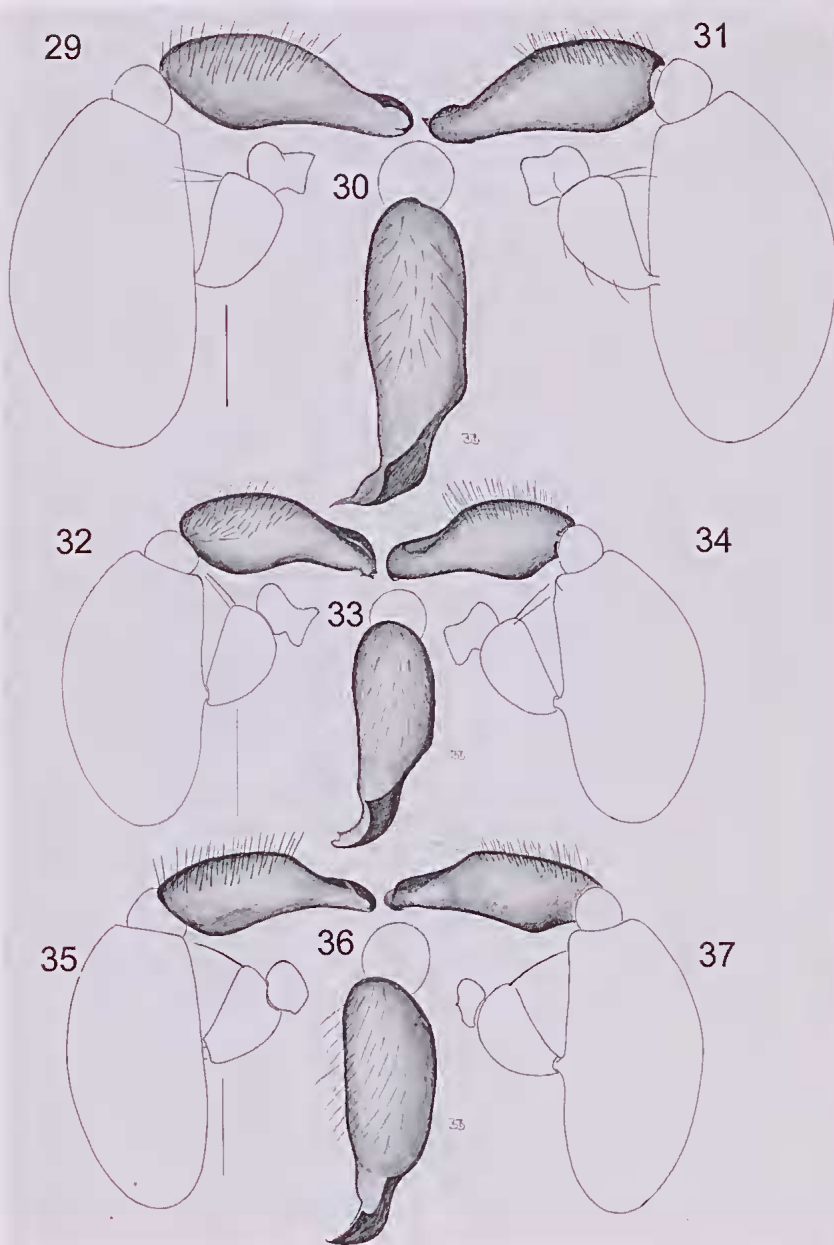


FIGS 15–19. *Opopaea antoniae* sp. nov. (PBI_OON 23360). 15–17, leg I dorsal view of tarsus (15), metatarsus (16) and tibia (17); 18, tarsal organ; 19, left palp dorsal.

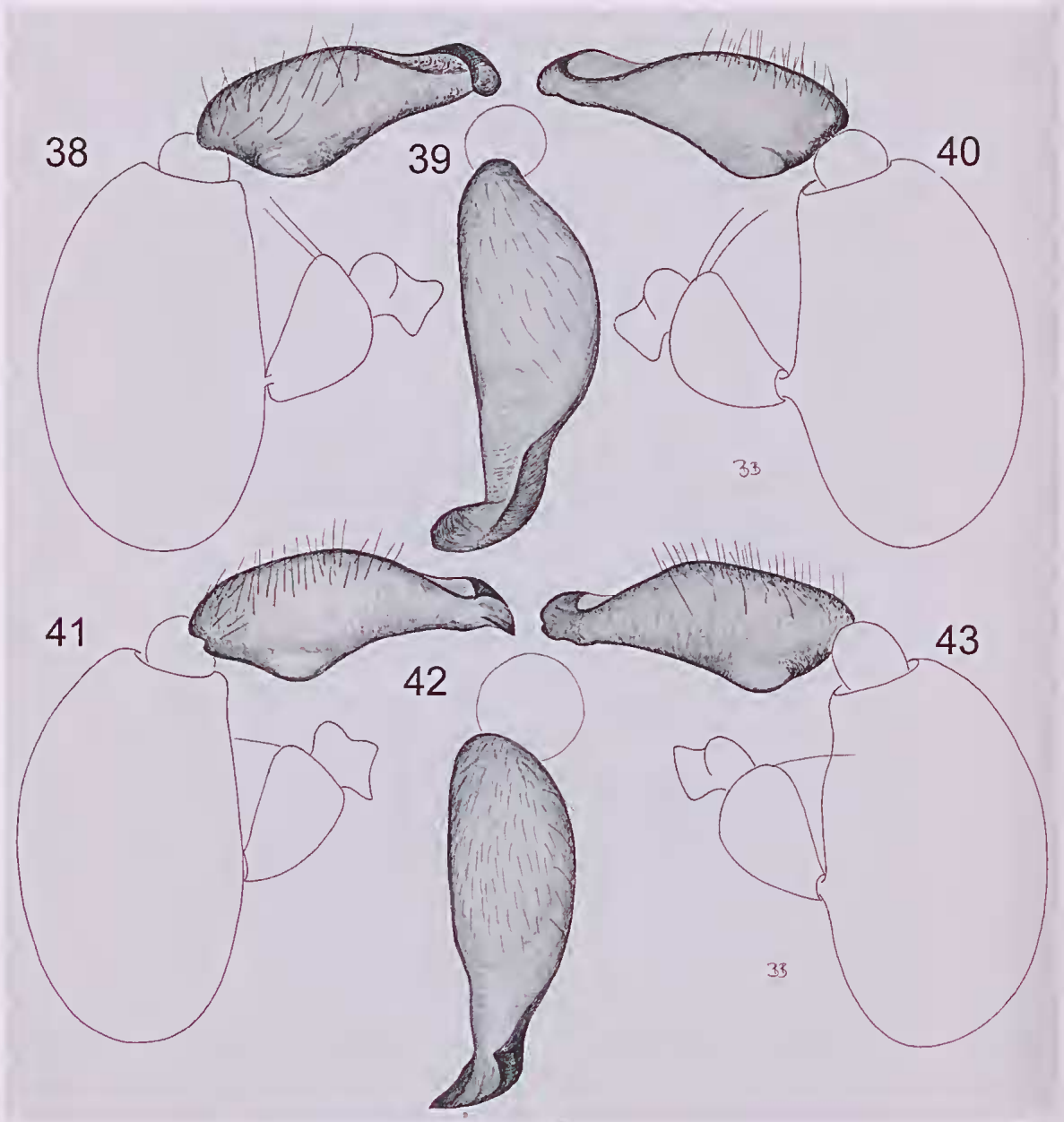


FIGS 20–28. *Opopaea* species left palp. 20, 23, 26, prolateral view; 21, 24, 27, dorsal view; 22, 25, 28, retrolateral view. 20–22, *O. olivernashii* sp. nov. (PBI_OON 23254); 23–25, *O. antoniae* sp. nov. (PBI_OON 23239); 26–28, *O. leica* sp. nov. (PBI_OON 23237). L, patella length; C, length of connection to femur. Scale bar = 0.1 mm.

New *Opopaea* species from Lamington NP

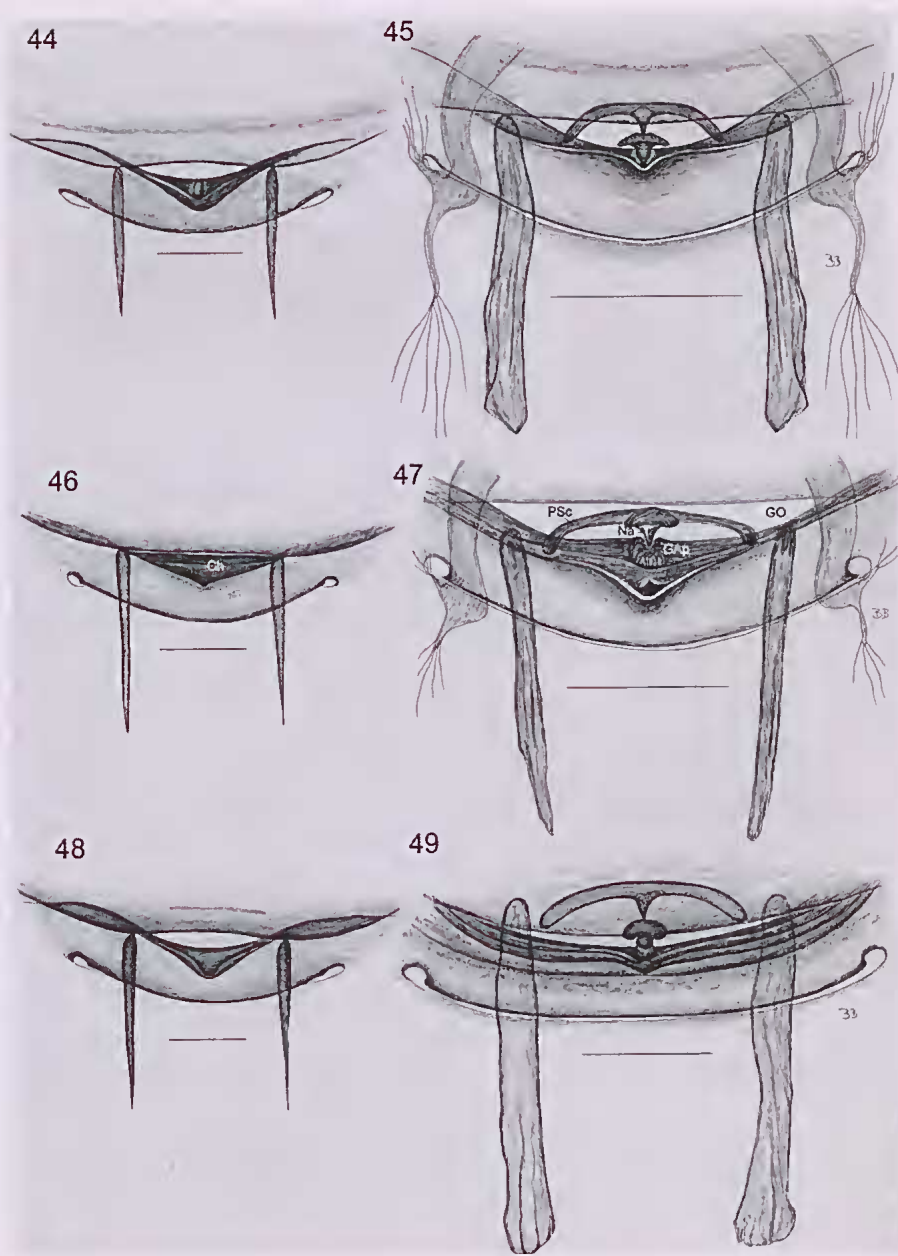


FIGS 29–37. *Opopaea* species left palp. 29, 32, 35, proterolateral view; 30, 33, 36, dorsal view; 31, 34, 37, retrolateral view. 29–31, *O. jonesae* sp. nov. (PBI_OON 22746); 32–34, *O. sown* sp. nov. (PBI_OON 22751); 35–37, *O. rogerkitchingi* sp. nov. (PBI_OON 22772). Scale bars = 0.1 mm.

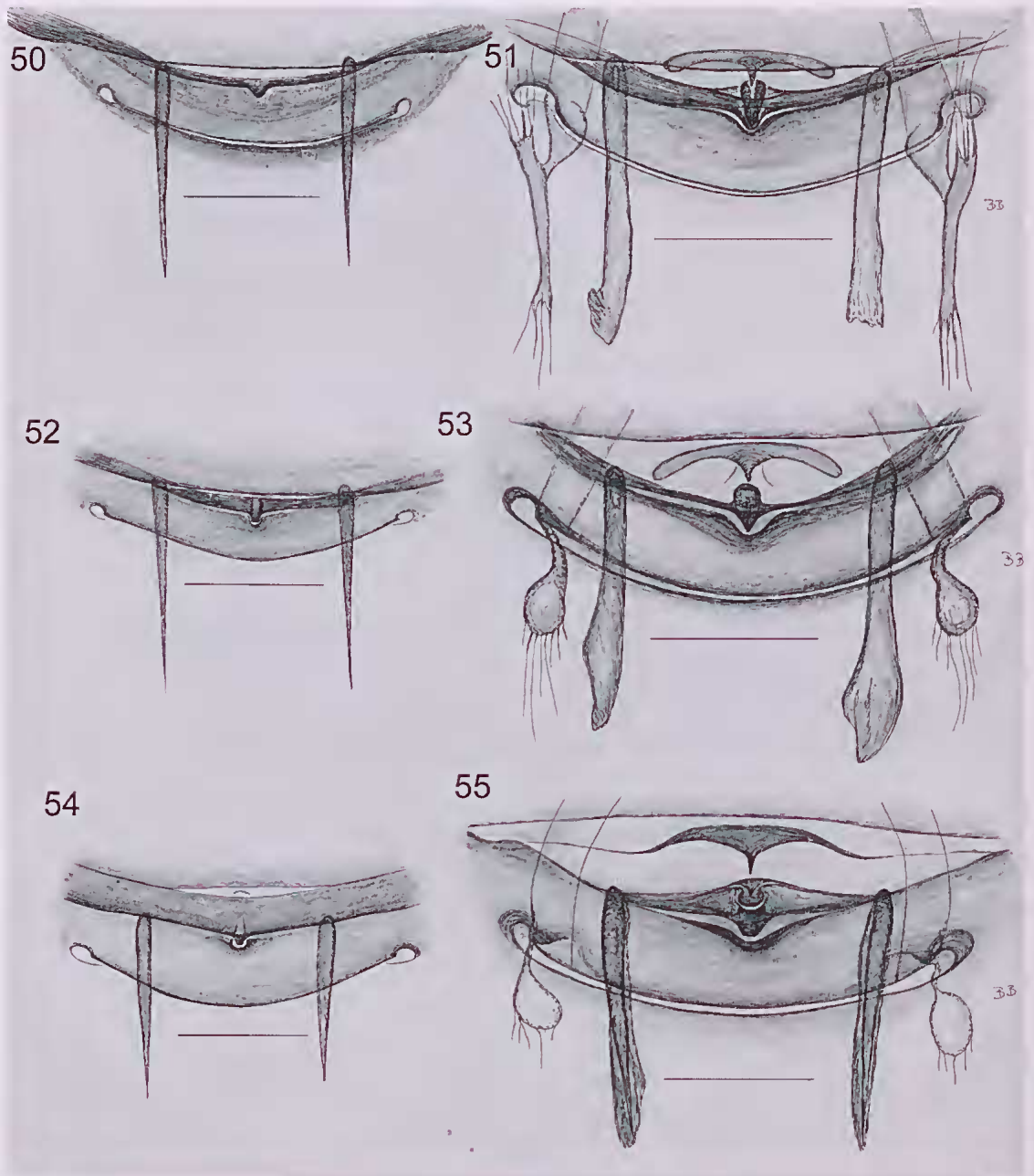


FIGS 38–43. *Opopaea* species left palp. 38, 41, prolatateral view; 39, 42, dorsal view; 40, 43, retrolateral view. 38–40, *O. yukii* sp. nov. (PBI_OON 6383); 41–43, *O. speighti* sp. nov. (PBI_OON 23256).

New *Opopaea* species from Lamington NP



FIGS 44–49. *Opopaea* species epigyne. 44, 46, 48, ventral view; 45, 47, 49, dorsal view. 44–45, *O. olivernashi* sp. nov. (PBI_OON 23362); 46–47, *O. antoniae* sp. nov. (PBI_OON 23341); 48–49, *O. leica* sp. nov. (PBI_23282). Ch, chitinised area; GAP, globular appendix; GO, genital opening; Na, nail-like process; PSc, paddle-like sclerite. Scale bars = 0.1 mm.



FIGS 50-55. *Opopaea* species epigyne. 50, 52, 54, ventral view; 51, 53, 55, dorsal view. 50-51, *O. sown* sp. nov. (PBI_OON 23289); 52-53, *O. jonesae* sp. nov. (PBI_OON 23267); 54-55, *O. rogerkitchingi* sp. nov. (PBI_OON 22734). Scale bars = 0.1 mm.

IV and with hair tuft (Fig. 60). *Abdomen*: Book lung covers large, ovoid. *Palp* (26, 28): patella big, club-shaped, $W/L=0.59$; connection to femur $C/L=0.39$; $L=0.255$; $W=0.150$; $C=0.100$; cymbium completely fused with bulb, no seam visible, distal end medially bent with sharp corner.

Female. (paratype, PBI_OON 23282) Total length 1.93. As in male except as noted. *Eyes* large. ALE: 0.065; PME: 0.55; PLE: 0.46; eye quadrangle: 0.199. *Genitalia* (Figs 46, 47): Chitinised area (Ch), in ventral view, a widely triangular sclerite; globular appendix (GAp) separated into a small posterior globular and an anterior hoodlike part, with the GAp well separated from the chitinised plate (Ch).

Distribution. Only known from the southeast corner of Queensland (Fig. 63).

Opopaea olivernashi sp. nov.
(Figs 4, 20–22, 44, 45, 61, 63)

Etymology. A patronym in honour of Oliver Nash, an 8 year old boy who has been fascinated by spiders since he was 4 years old.

Material. Holotype ♂, Queensland, Lamington NP, 0.5 km SSE Binna Burra Lodge, 28.198°S 153.190°E, 770 m, 18 Mar 2008, SW, AN, berlesate sifted litter (PBI_OON 23254, QM S86323). PARATYPE, QUEENSLAND, 1♀, Lamington NP IBISCA, 500A, 28.35°S 153.2333°E, 560 m, 28 Jan 2008, SW, AN, litter extract (PBI_OON 23362, QM S87068). Other *Material*. QUEENSLAND, IBISCA 500A: 1♂, 28 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23269, QM S86389; PBI_OON 23279, QM S86392). IBISCA 500C: 1♂, 28 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23278, QM S86388). IBISCA 500D: 6♂, 28 Jan 2008, SW, AN, litter extract (PBI_OON 23313, QM S86379, PBI_OON 23363, QM S87069). IBISCA 700C: 1♂, 20 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23286, QM S86353). IBISCA 850, 1♂, 29 Jan 2008, AN, bark spray (PBI_OON 23283, QM S86337). 1♂, Lamington NP, 0.5 km SSE Binna Burra Lodge, 28.198°S 153.190°E, 770 m, 18 Mar 2008, SW, AN, berlesate sifted litter (PBI_OON 23292, QM S86324); 1♂ same data except pyrethrum (PBI_OON 23271, QM S86362).

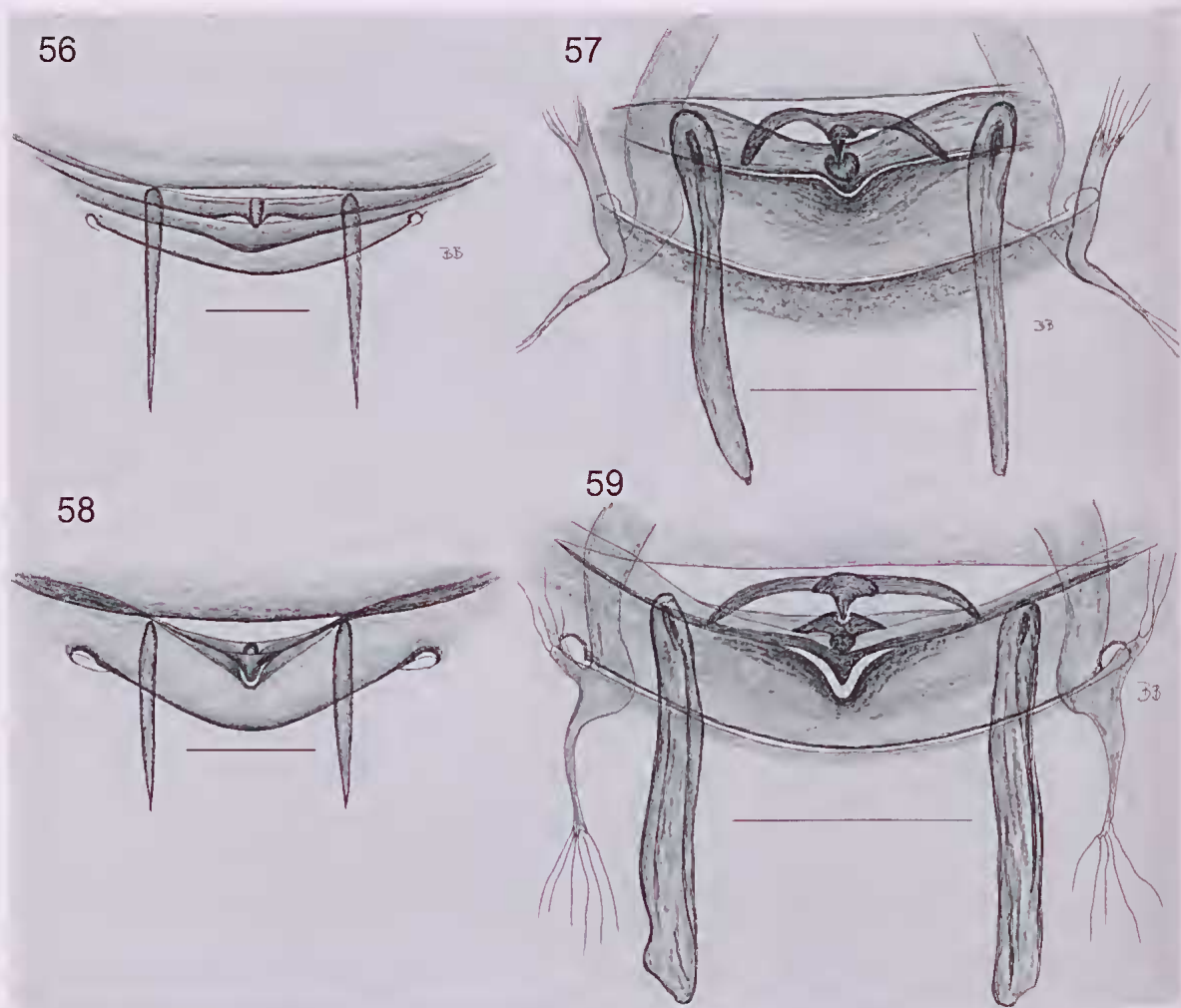
Other diagnosis. *Opopaea olivernashi* resembles *O. antoniae* in colour and eye size. Males of *O. olivernashi*

and *O. antoniae* are the only Lamington species with a retrolateral seam between the bulb and cymbium. Males of *O. olivernashi* can be easily separated by their broad patella, the more subbasal connection to the femur ($C/L=0.37$), the sternum with an anterior fold just behind labium, about $\frac{3}{4}$ of the length of the labium (Fig. 61), and the more swollen bulb. Females can be distinguished from all other *Opopaea* species by the globular appendix divided into a hood and a v-shaped extension (Fig. 45).

Description. *Male* (holotype, PBI_OON 23254). Total length 1.44. *Colour in alcohol*. Body and palpal patella dark yellow-brown, legs pale orange. *Carapace* broadly oval in dorsal view, pars cephalica slightly elevated in lateral view, with angular posterolateral corners. *Chypeus* with 4 long setae in slightly v-shaped arrangement. *Eyes* large, ALE largest; ALE: 0.077; PLE: 0.044; PME: 0.057; Eye-group width: 0.212; PME oval, PLE circular; ALE separated by less than their radius, ALE-PLE separated by less than ALE radius, PME touching throughout most of their length, PLE-PME separated by less than PME radius. *Sternum* (Fig. 61) with anterior fold just behind labium, about $\frac{3}{4}$ of length of labium, and without posterior swelling between coxae IV. *Abdomen*: Book lung covers large, ovoid. *Palp* (Figs 22–24) patella big, club-shaped, $W/L=0.63$; connection to femur $C/L=0.37$; $L=0.208$; $W=0.132$; $C=0.077$; cymbium fused with bulb but with clearly defined seam between, with distal patch of setae; bulb orange-brown.

Female. (PBI_OON 23362) Total length 1.87. As in male except as noted. *Chypeus* with 4 long setae forming in inverted v-shaped arrangement. *Eyes* large, ALE: 0.064; PME: 0.054; PLE: 0.45; eye quadrangle: 0.197. *Genitalia* (Figs 44, 45): in ventral view, chitinised area (Ch) a widely triangular plate rounded posteriorly, separated into 2 parts; in dorsal view paddle-like sclerite (PSc) with evenly bent arms; nail-like process (Na) small; globular appendix (GAp) divided into hood and v-shaped extension.

Distribution. Only known from the southeast corner of Queensland (Fig. 63).



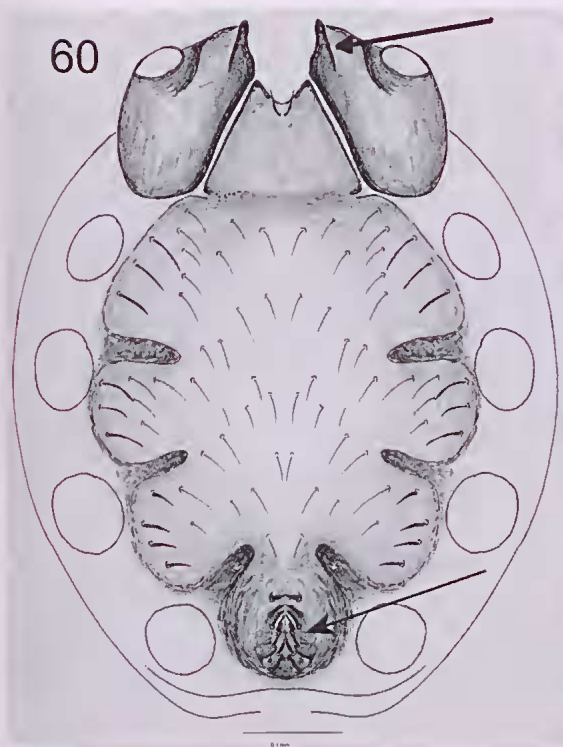
FIGS 56–59. *Opopaea* species epigyne. 56, 58, ventral view; 57, 59, dorsal view. 56–57, *O. yukii* sp. nov. (PBI_23299); 58–59, *O. speighti* sp. nov. (PBI_23295). Scale bars = 0.1 mm.

***Opopaea rogerkitchingi* sp. nov.**
(Figs 5, 35–37, 54, 55, 63)

Etymology. A patronym in honour of Prof. Roger Kitching from Griffith University, who founded the IBISCA-Queensland Project (Investigating the Biodiversity of Soil and Canopy Arthropods).

Material. Holotype ♂, Queensland, Lamington NP, IBISCA, 1100C, 28.260°S 153.167°E, 1106 m, 16 Mar 2007, CB, night hand coll. (PBI_OON 22772, QM

579897). PARATYPE, QUEENSLAND, 1♀, Lamington NP, IBISCA 1100D, 28.262°S 153.170°E, 1140 m, 5–7 Oct 2006, JB, KS, pitfall (PBI_OON 22734, QM S81149). OTHER MATERIAL, QUEENSLAND, IBISCA 700C: 2♀, 11–20 Oct 2006, KS, pitfall (PBI_OON 22735, QM S81066). IBISCA 900A: 1♀, 11–20 Mar 2007, DP, KS, pitfall (PBI_OON 23326, QM S86398). IBISCA 900C: 1♀, 11–20 Mar 2007, DP, KS, pitfall (PBI_OON 23324, QM S86396); 1♀, 24 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23325, QM S86399); 1♂, 28 Mar–2 Apr 2007, GM, fungus pitfall (PBI_OON



FIGS 60–62. *Opopaea* species, male sternum ventral. 60, *O. leica* sp. nov. (PBI_23237), top arrow pointing to tooth-like projection at anteromedian tip of endite, bottom arrow pointing to posterior hump and hair tuft between coxae IV; 61, *O. olivernashii* sp. nov. (PBI_23279), arrow pointing to anterior fold just behind labium; 62: *O. jonesae* sp. nov. (PBI_22751), arrow pointing to posterior swelling with longitudinal row of setae.

23242, QM S86314). IBISCA 900D: 1♂, 5–8 Oct 2006, KS, BB, pitfall (PBI_OON 22757, QM S81141). IBISCA 1100A: 1♂, 1♀, 11–20 Oct 2006, S. Maunsell, pitfall (PBI_OON 22752, QM S81060); 2♂, 11–20 Mar 2007, DP, K. Staunton, pitfall (PBI_OON 23294, QM S86361); 1♀, 27 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23329, QM S86397). IBISCA 1100B: 1♂, 27 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23291, QM S86394), 2♀, same data (PBI_OON 23290,

QM S86365). IBISCA 1100C: 1♂, 2–5 Oct 2006, KS, B. Taylor, pitfall (PBI_OON 22771, QM S81016); 1♀, 7–11 Oct 2006, KS, pitfall (PBI_OON 22730, QM S81132); 1♂, 11–20 Mar 2007, DP, KS, pitfall (PBI_OON 23297, QM S86359). IBISCA 1100D: 1♂, 5–7 Oct 2006, JB, KS, pitfall (PBI_OON 22753, QM S81085). 1♀, Lamington Plateau, 28.317°S 153.067°E, 31 Oct 1982, J. Grimshaw, litter (PBI_OON 7215, QM S78257).

Diagnosis. *Opopaea rogerkitchiungi* resembles *O. jonesae* in colour and both species have small eyes that are equal in size. Males of *O. rogerkitchiungi* and *O. jonesae* also share a slim bulb, and a palpal patella with a median connection to the femur ($C/L=0.52$). Males of *O. rogerkitchiungi* can be easily separated by the centrally directed sternal setae between coxae IV and the distal part of bulb which has a medially bent, sharp tip (Fig. 36). Females of *O. rogerkitchiungi* can be distinguished from those of *O. jonesae* by the broad chitinised area near the genital opening (Fig. 54).

Description. *Male* (holotype, PBI_OON 22772). Total length 1.52. *Colour in alcohol.* Body yellow-brown, legs pale orange, palpal patella reddish brown. *Carapace pars cephalica* flat in lateral view, with angular posterolateral corners. *Eyes* small, subequal; ALE: 0.034; PME: 0.030; PLE: 0.021; eye quadrangle: 0.130, PME oval, PLE circular; ALE separated by more than their diameter, ALE-PLE separated by less than ALE radius, PME touching for less than half their length, PLE-PME separated by PME radius to PME diameter. *Sternum* posterior part of sternum between coxae IV bulging, with setae directed centrally. *Abdomen:* book lung covers large, ovoid. Palp (Figs 35–37): patella big, club-shaped, $W/L=0.47$; connection to femur $C/L=0.52$; $L=0.330$; $W=0.156$; $C=0.173$; cymbium completely fused with bulb, no seam visible, distally with medially bent, sharp tip. *Female* (paratype, PBI_OON 22734). Total length 1.62. As in male except as noted. *Eyes* small. ALE: 0.034; PME: 0.035; PLE: 0.027; eye quadrangle: 1.41. *Genitalia* (Figs 54, 55): chitinised area (Ch) a broad band in ventral view; in dorsal view, paddle-like sclerite (PSc) with evenly bent arms; nail-like process (Na) not separated; globular appendix (GAp) globular with a small globular anterior part and a squared posterior part.

Distribution. Only known from the southeast corner of Queensland (Fig. 63).

Opopaea sown sp. nov.
(Figs 6, 32–34, 50, 51, 63)

Etymology. A patronym in honour of Anne Jones' company named "Save Our Waterways Now Inc" (also known as SOWN) and her support for this taxonomic work.

Material. Holotype ♂, Queensland, Lamington NP, IBISCA, 300B, 28.155°S 153.139°E, 282 m, 6 Oct 2006, BB, hand coll. (PBI_OON 22746, QM S75881). OTHER MATERIAL, QUEENSLAND, IBISCA 300B: 1♂, 13–22 Mar 2007, DP, KS, pitfall (PBI_OON 23250, QM S86321); 1♀, 25 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23287, QM S86349). IBISCA 300C: 1♂, 12–21 Feb 2007, KS, pitfall (PBI_OON 22710, QM S76076); 1♂, 25 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23288, QM S86345), 2♀, (PBI_OON 23285, QM S86348, PBI_OON 23288, QM S86345). IBISCA 300D: 1♀, 1♂, 25 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23289, QM 86347).

Diagnosis. *Opopaea sown* is the smallest *Opopaea* species from Lamington National Park. It resembles *O. rogerkitchiungi* and *O. jonesae* in colour and in having small equal-sized eyes. Males of *O. sown*, *O. rogerkitchiungi* and *O. jonesae* all have a slim bulb and a palpal patella with a median connection to the femur ($C/L=0.47$ in *O. sown*). Males of *O. sown* can be easily separated from both the other species by the sternum, which has evenly scattered setae (as in Fig. 11) and is unswollen between coxae IV, and by the bifurcate distal part of the bulb (Fig. 33). Females of *O. sown* can be distinguished from those of *O. jonesae* by having a globular appendix (GAp) that lacks a hood but has a long, wedge-like extension (Fig. 51).

Description. *Male* (holotype, PBI_OON 22746). Total length 1.31. *Colour in alcohol.* Body and legs pale orange, palpal patella orange-brown. *Carapace* broadly oval in dorsal view, *pars cephalica* flat in lateral view, with angular posterolateral corners. *Eyes* small, subequal; ALE: 0.041; PME: 0.035; PLE: 0.023; eye quadrangle: 0.143; PME oval; PLE circular; ALE separated by their radius to diameter, ALE-PLE separated by less than ALE radius, PME touching for less

than half their length, PLE-PME separated by less than PME radius. *Sternum* without posterior hump between coxae IV; setae sparse, evenly scattered. *Abdomen*, book lung covers large, ovoid. *Palp* (Figs 32–34) patella big, club-shaped, $W/L=0.53$; connection to femur $C/L=0.47$; $L=0.265$; $W=0.140$; $C=0.125$; cymbium completely fused with bulb, no seam visible, bulb with bifurcate, medially bent distal part (Fig. 33).

Female. (PBI_OON 23289) Total length 1.45. As in male except as noted. *Eyes* small subequal; ALE: 0.046; PLE: 0.025; PME: 0.036; eye quadrangle: 0.136. *Genitalia* (Figs 50, 51): narrow, widely triangular chitinised area (Ch) with small median triangle in ventral view; in dorsal view, paddle-like sclerite (PSc) with evenly thick, nearly straight arms; nail-like process (Na) relatively small, well separated; globular appendix (GAp) globular with long triangular wedge-like extension, embedded in chitinised area.

Distribution. Only known from the southeast corner of Queensland (Fig. 63).

Opopaea speighti sp. nov.
(Figs 7, 41–43, 58, 59, 63)

Etymology. A patronym in honour of David Speight who loves little creatures. He is the son of Dr Shelia Bryan who supported spider taxonomy through the Queensland Museum.

Material. Holotype ♂, Queensland, Lamington NP, IBISCA, 1000, 28.247°S 153.149°E, 995 m, 10 Feb 2008, CB, AN, leaf litter extract (PBI_OON 23256, QM S86363). PARATYPE, QUEENSLAND, 1♀, Lamington NP, IBISCA, 1000, 28.247°S 153.149°E, 995 m, 10 Feb 2008, CB, AN, leaf litter extract (PBI_OON 23295, QM S86364). OTHER MATERIAL, QUEENSLAND, IBISCA 900A: 1♀, 5–8 Oct 2006, KS, pitfall (PBI_OON 22754, QM S81024); 1♂, 18 Jan 2008, AN, leaf litter extract (PBI_OON 23321, QM S86404). IBISCA 900C: 1♂, 24 Jan 2008, SW, AN, leaf litter extract (PBI_OON 23327, QM S86405).

Diagnosis. *Opopaea speighti* resembles *O. leica* in having a completely fused bulb and cymbium, and a triangular, medially bent distal part of the bulb (Figs 27, 42). Males of *O. speighti* can be easily

separated by their flat sternum which lacks any posterior swelling between coxae IV. Females of *O. speighti* can be distinguished from those of all other *Opopaea* species by the genitalia which have a narrow, triangular, posteriorly directed extension of the chitinised area in ventral view (Fig. 58) and the globular appendix divided into a widely triangular, hood-shaped anterior part and a small, globular posterior extension that is not embedded in the chitinised area (Fig. 59).

Description. *Male* (holotype, PBI_OON 23256). Total length 1.50. *Colour in alcohol.* Body yellow-brown, legs pale orange, palpal patella reddish brown. *Carapace* broadly oval in dorsal view, pars cephalica slightly elevated in lateral view, with angular posterolateral corners. *Chlypens* with 4 long setae in slightly v-shaped position and 2 additional setae bending backwards. *Eyes* large but PME largest; ALE: 0.048; PLE: 0.038; PME: 0.050; eye-group width: 0.186 (mm), PME largest, PME oval, PLE circular; ALE separated by their radius to diameter, ALE-PLE separated by less than ALE radius, PME touching throughout most of their length, PLE-PME separated by less than PME radius. *Sternum* evenly covered with posteriorly directed setae. *Abdomen*, book lung covers large, ovoid. *Palp* (Figs 41–43) patella big, club-shaped, $W/L=0.58$; connection to femur $C/L=0.45$. $L=0.310$; $W=0.181$; $C=0.139$; cymbium completely fused with bulb, distal end long triangular and bent medially.

Female. (paratype, PBI_OON 23295) Total length 1.97. As in male except as noted. *Eyes* large, ALE largest; ALE: 0.070; PLE: 0.053; PME: 0.058; eye quadrangle: 0.217. *Genitalia* (Figs 58, 59): narrow triangular chitinised area (Ch) with long, narrow, posteriorly directed triangular extension in ventral view; in dorsal view paddle-like sclerite (PSc) with wide, evenly bent arms; nail-like process (Na) large, well-separated; globular appendix (GAp) with wide anterior triangular hood and small globular posterior extension, not embedded in chitinised area.

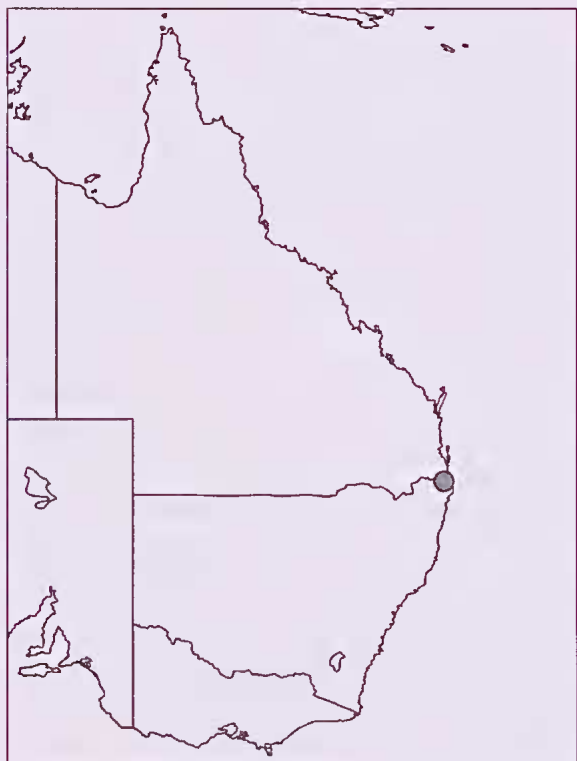


FIG. 63. Map of eastern Australia indicating the location of Lamington National Park and the eight *Opopaea* species described herein.

Distribution. Only known from the southeast corner of Queensland (Fig. 63).

Opopaea yukii sp. nov.
(Figs 8, 9, 38–40, 56, 57)

Etymology. Named for Yuki Nakamura, the son of Aki Nakamura, from the Queensland Museum, who collected many of the specimens examined in this study.

Material. Holotype ♂, Queensland, Lamington NP, IBISCA, 700D, 28.204°S 153.129°E, 748 m, 12 Mar 2007, GT, bark spray (PBI_OON 6383, QM S75399). PARATYPE, QUEENSLAND, 1♀, Lamington NP, IBISCA, 700D, 28.204°S 153.129°E, 748 m, 12 Mar 2007, GT, bark spray (PBI_OON 23357, QM S84084). OTHER MATERIAL, QUEENSLAND, IBISCA 300A: 3♀, 1♂, 8 Mar 2007, GT, bark spray (PBI_OON 6373, QM S75389; PBI_OON 6377, QM S75393); 1♀, 9–11

Oct 2006, KS, pitfall (PBI_OON 22728, QM S81051); 8♂, 16 Oct 2006, CB, bark spray (PBI_OON 22665, QM S79843, PBI_OON 22674, QM S79837), 5♀ (PBI_OON 22665, QM S79843, PBI_OON 22674, QM S79837); 1♀, 2♂, 25 Jan 2008, SW, bark spray (PBI_OON 23304, QM S86341). IBISCA 300B: 5♀, 1♂, 16 Oct 2006, CB, bark spray (PBI_OON 22677, QM S79842; PBI_OON 22693, QM S79841); 1♀, 14–23 Jan 2007, KS, pitfall (PBI_OON 23244, QM S86313); 2♀, 1♂, 9 Mar 2007, GT, AM, bark spray (PBI_OON 6389, QM S75406); 2♀, 1♂, 25 Jan 2008, SW, bark spray (PBI_OON 23299, QM S86350); 3♀, 3♂, 25 Jan 2008, AN, bark spray (PBI_OON 23255, QM S86329). IBISCA 300C: 1♂, 21 Oct 2006, CB, bark spray (PBI_OON 22688, QM S79836); 2♂, 21 Oct 2006, CB, bark spray (PBI_OON 22676, QM S79822); 1♂, 27 Oct 2006, CB, night hand coll. (PBI_OON 22719, QM S79896); 4♀, 1♂, 25 Jan 2008, SW, bark spray (PBI_OON 23302, QM S86326); 1♀, 2♂, 25 Jan 2008, AN, bark spray (PBI_OON 23300, QM S86342). IBISCA 300D: 1♂, 2–6 Oct 2006, BB, KS, pitfall (PBI_OON 22712, QM S79898); 1♂, 6–9 Oct 2006, KS, pitfall (PBI_OON 22717, QM S81097); 3♂, 16 Oct 2006, CB, bark spray (PBI_OON 22678, QM S79840, PBI_OON 22690, QM S79828); 8♂, 9 Mar 2007, GT, AM, bark spray (PBI_OON 6387, QM S75402; PBI_OON 6397, QM S75414); 2♀, 25 Jan 2008, SW, bark spray (PBI_OON 23301, QM S86344); 1♀, 3♂, 25 Jan 2008, AN, bark spray (PBI_OON 23303, QM S86351). IBISCA 500A: 7♀, 2♂, 14 Mar 2007, GT, bark spray (PBI_OON 6374, QM S75390); 1♀, 1♂, 19 Mar 2007, SW, bark spray (PBI_OON 6412, QM S75429); 1♀, 28 Jan 2008, SW, bark spray (PBI_OON 23328, QM S86402). IBISCA 500B: 1♀, 28 Jan 2008, AN, bark spray (PBI_OON 23298, QM S86377). IBISCA 500C: 1♀, 28 Jan 2008, SW, bark spray (PBI_OON 23296, QM S86378). IBISCA 500D: 5♀, 28 Jan 2008, AN, bark spray (PBI_OON 23323, QM S86403). IBISCA 700A: 1♀, 10 Mar 2007, GT, bark spray (PBI_OON 6376, QM S75392); 3♂, 8♀, 10 Mar 2007, GT, bark spray (PBI_OON 6372, QM S75388); 2♀, 20 Oct 2006, CB, bark spray (PBI_OON 22687, QM S79833); 3♂, 10 Mar 2007, GT, bark spray (PBI_OON 6381, QM S75397); 1♂, 26 Sep 2008, GM, FT, bark spray (PBI_OON 23359, QM S87070); 2♀, (PBI_OON 00023359, QM S87070). IBISCA 700B: 3♀, 20 Oct 2006, CB, bark spray (PBI_OON 22682, QM S79821); 2♂, 20 Oct 2006, CB, bark spray (PBI_OON 22671, QM S79827); 3♀, (PBI_OON 22671, QM S79827); 1♂, 28 Oct 2006, CB, night hand coll. (PBI_OON 22747, QM S75879). IBISCA 700D: 1♂, 19 Oct 2006, CB, bark spray (PBI_OON 22667, QM S79818); 2♂, 12 Mar 2007, GT, AM, bark spray (PBI_OON 6406, QM S75423); 1♂, 20 Jan 2008, AN, bark spray (PBI_OON 23252, QM S86328). IBISCA 900D: 1♂, 8 Mar 2007, GT, bark spray (PBI_OON

6413,
Q M

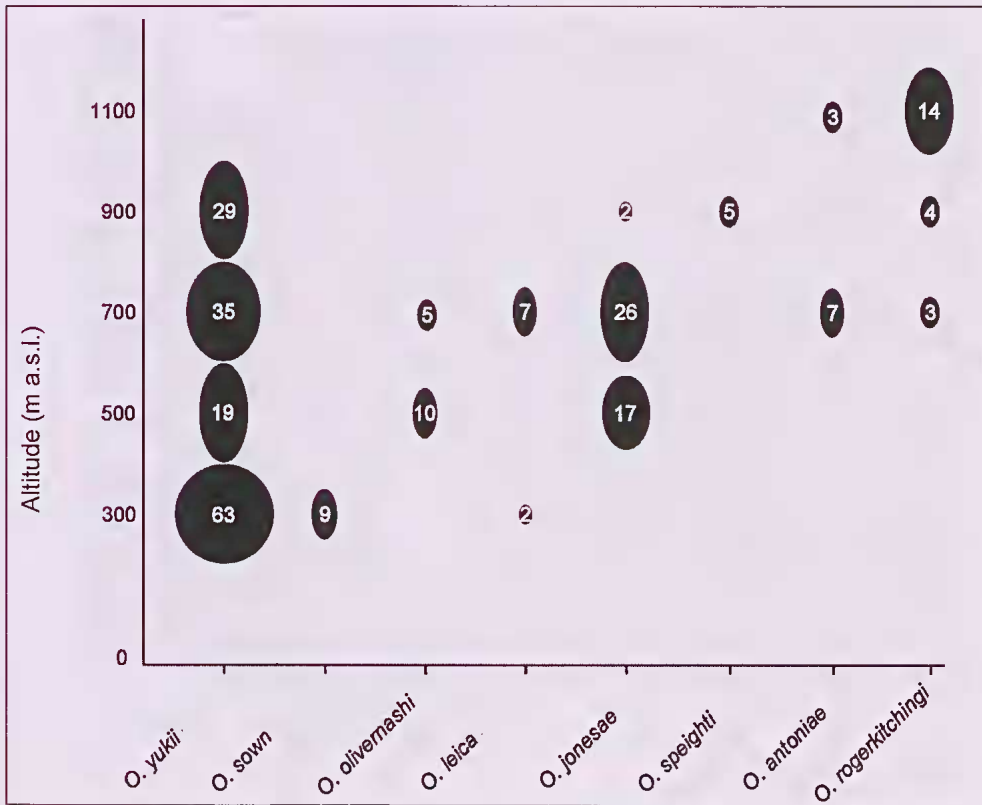


FIG. 64. Altitudinal distribution of the eight *Opopaea* species of the Lamington National Park based on a total of 255 specimens collected during the IBISCA-Queensland project. Oval lines indicate the small-eyed litter species (*O. sown* sp. nov., *O. jonesae* sp. nov., *O. rogerkitchingi* sp. nov.).

S75431), 1♀, (PBI_OON 6380, QM S75395); 1♂, 9 Mar 2007, GT, bark spray (PBI_OON 6408, QM S75426); 6♀, 10 Mar 2007, GT, bark spray (PBI_OON 6386, QM S75403); 2♀, 19 Mar 2007, SW, bark spray (PBI_OON 6410, QM S75428). IBISCA 1100A: 1♂, 25 Oct 2006, CB, bark spray (PBI_OON 23238, QM S86312).

Diagnosis. Males and females of *O. yukii* can be easily separated from all other *Opopaea* species from Lamington National Park by their flat bodies and long oval abdomens (Figs 8, 9). The male sternum has no posterior swelling between coxae IV and the distal end of the palpal bulb is long, medially bent and scoop-shaped.

Females can be distinguished from those of all other *Opopaea* species by having the chitinised area a narrow band with a small sinuous posterior extension (Fig. 56) in ventral view and the globular appendix not divided but small, globular and embedded in the chitinised area (Fig. 57).

Description. *Male* (holotype, PBI_OON_6383). Total length 1.65. *Colour in alcohol.* Body orange-brown, legs yellow, palpal patella reddish brown. *Carapace* flat in lateral view, with angular posterolateral corners. *Eyes* large, ALE largest; ALE: 0.076; PLE: 0.048; PME: 0.052; eye group width=0.212, PME circular, PLE oval; posterior

eye row straight from front; ALE separated by less than their radius, ALE-PLE touching, PME touching throughout most of their length, PLE-PME touching. *Sternum* without posterior swelling; setae sparse, evenly scattered. *Abdomen*, book lung covers large, ovoid. Palp (Figs 38–40) patella club-shaped, $W/L=0.55$; connection to femur $C/L=0.46$. $L=0.330$; $W=0.180$; $C=0.15$; cymbium completely fused with bulb.

Female. (PBI_OON 23357) Total length 1.80. As in male except as noted. *Eyes* large; ALE: 0.075; PLE: 0.044; PME: 0.051; eye quadrangle 0.211. *Genitalia* (Figs 56, 57): Chitinised area a narrow band with small sinuous posterior extension in ventral view (Fig. 56); in dorsal view paddle-like sclerite (PSc) with wide, evenly bent arms; nail-like process (Na) small well-separated; globular appendix (GAp) not divided but small, globular, embedded in chitinised area (Fig. 57).

Distribution. Only known from the southeast corner of Queensland (Fig. 63).

ACKNOWLEDGMENTS

This paper is dedicated to the people and institutions that support taxonomic science with their encouragement. This paper would not have been completed without the efforts of Roger Kitching who founded the IBISCA-Queensland project. I am deeply grateful to the Department of State Development of the State of Queensland for the Smart State funding which made this project possible. Their generous funding was matched by funding from Griffith University, the Queensland Museum, the Queensland Herbarium, the Global Canopy Programme (Oxford), NRM Queensland (SEQ Catchments) and the Queensland National Parks Association. Cash support for the IBISCA-QLD project was also received from the federal Department of Environment, Heritage and the Arts and O'Reillys' Rainforest Resort. This taxonomic work was also supported by the National Science Foundation's PBI (Planetary

Biodiversity Inventory) program through grant DEB-0613754. Thanks to Owen Seeman and Wendy Hebron (Queensland Museum, Brisbane) for the loan of the material and their great support of the work. I particularly would like to thank members of the IBISCA-Queensland team, Chris Burwell, Geoff Monteith, Aki Nakamura, David Putland, Kyran Staunton, Geoff Thompson, Federica Turco and Susan Wright from the Queensland Museum and Griffith University who collected the *Opopaea* specimens here examined. Special thanks to Robert Raven, for his great support with the SEM work using the Hitachi S530. I also would like to thank my daughters; Johanna, who assisted passionately in databasing and developing the distribution chart for the *Opopaea* specimens, and Ursula for being patient.

LITERATURE CITED

- Baehr, B.C. 2008. Revision of the Australian antspider genus *Habronestes* L. Koch, 1872 (Araneae: Zodariidae): III The *Habronestes macedonesis*-group in Queensland and New South Wales. *Memoirs of the Queensland Museum* 52: 25-47.
- Baehr, B.C. & Smith, H.M. 2008. Three new species of the Australian orsolobid spider genus *Hickmanolobus* (Araneae: Orsolobidae). *Records of the Western Australian Museum* 24: 325-336.
- Baehr, B.C., Harvey, M.S. & Smith, H.M. 2010. The new endemic Australian goblin spider genus *Cavisternum* (Araneae: Oonopidae). *American Museum Novitates* 3684: 1-40.
- Burger, M. 2010. Complex female genitalia indicate sperm dumping in armored goblin spiders (Arachnida, Araneae, Oonopidae). *Zoology* 113: 19-32.
- Burwell, C.J. & Nakamura, A. 2011. Distribution of ant species along an altitudinal transect in continuous rainforest in subtropical Queensland, Australia. *Memoirs of the Queensland Museum - Nature* 55(2): 391-411.
- Harvey, M.S. 1987. *Grymeus*, a new genus of pouched oonopid spider from Australia (Chelicerata: Araneae). *Memoirs of the Museum of Victoria* 48: 123-130.

New *Opopaea* species from Lamington NP

2002. Short-range endemism in the Australian fauna: some examples from non-marine environments. *Invertebrate Systematics* 16: 555-570.
- Harvey, M.S. & Edward, K.L. 2007. Three new species of cavernicolous goblin spiders (Araneae, Oonopidae) from Australia. *Records of the Western Australian Museum* 24: 9-17.
- Hickman, V.V. 1932. Studies in Tasmanian spiders. Part V (The Oonopidae). *Papers and Proceedings of the Royal Society of Tasmania* 1931: 20-31.
1950. Araneae from Reevesby Island, South Australia. *Proceedings of the Royal Society Victoria (N.S.)* 60: 1-16.
1979. Some Tasmanian spiders of the families Oonopidae, Anapidae and Mysmenidae. *Papers and Proceedings of the Royal Society of Tasmania* 113: 53-79.
- Kitching, R.L., Putland, D., Ashton, L.A., Laidlaw, M.J., Boulter, S.L., Christensen, H. & Lambkin, C.L. 2011. Detecting biodiversity changes along altitudinal gradients: the IBISCA-Queensland Project. *Memoirs of the Queensland Museum - Nature* 55(2): 235-250.
- Koch, L. 1873. *Die Arachniden Australiens, nach der Natur beschrieben und abgebildet*. Nürnberg: Bauer und Raspe 1: 369-472.
- Ott, R. & Harvey, M.S. 2008a. A new species of *Xestaspis* (Araneae: Oonopidae) from the Pilbara region of Western Australia. *Records of the Western Australian Museum* 24: 337-342.
- 2008 b. A new species of *Pelcinus* from Barrow Island, Western Australia (Araneae: Oonopidae). *Arthropoda Selecta* 17(1-2): 81-85.
- Platnick, N.I. & Baehr, B. 2006. A revision of the Australasian ground spiders of the family Prodidomidae (Araneae: Gnaphosoidea). *Bulletin of the American Museum of Natural History* 298: 1-287.
- Platnick, N.I. 2009. *The world spider catalog, version 9.5*. American Museum of Natural History, New York. <http://research.amnh.org/entomology/spiders/catalog/index.html>
- Platnick, N. I. & Dupérré, N. 2009. The goblin spider genera *Opopaea* and *Epectris* (Araneae, Oonopidae) in the New World. *Bulletin of the American Museum of Natural History* 3649: 1-43.
- Rainbow, W.J. 1920. Arachnida from Lord Howe and Norfolk Islands. *Records of the South Australian Museum* 1: 229-272.
- Raven, R.J. & Stumkat, K.S. 2005. Revisions of Australian ground-hunting spiders: II. Zoropsidae (Lycosoidea: Araneae). *Memoirs of the Queensland Museum* 50: 347-423.
- Rix, M.G. 2006. Systematics of the Australasian spider family Pararchaeidae (Arachnida: Araneae). *Invertebrate Systematics* 20: 203-254.
- Simon, E. 1908. Araneae. 1^{re} partie. In W. Michaelsen & R. Hartmeyer (editors), *Die Fauna Südwest-Australiens* 1: 359-446. Jena: Gustav Fischer.
- Tempelton, R. 1835. On the spiders of the genus *Dysdera* Latr. with the description of a new allied genus. *Zoological Journal* 5: 400-408.